REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

The specification has been amended to place the subject application in better form. A new abstract has also been presented in accordance with preferred practice. No new matter has been added by these changes.

Claims 1-55 are presented for consideration. Claims 1, 16, 25, 31, 36 and 41-55 are independent. Claim 1 has been amended to clarify features of the invention. Support for these changes can be found in the application, as filed. Therefore, no new matter has been added.

Applicants note that the Examiner has made final the election of species requirement previously set forth. Claims 16-55, withdrawn from consideration, have been retained in this application in order to preserve Applicants' rights. Applicants reserve the right to file one or more divisional applications directed to the subject matter of these claims. Further, Applicants request that the Examiner contact their undersigned representative should it be necessary to cancel these claims in order to advance the subject application to issue.

Applicants further note with appreciation that claims 8-13 have been indicated as containing allowable subject and would be allowed if rewritten in independent form. Applicants earnestly believe, however, that they should be entitled to the protection afforded by independent claim 1, as presented. Therefore, these claims have not been so rewritten at this time.

Applicants request favorable reconsideration and withdrawal of the rejections set forth in the above-noted Office Action.

Claims 1, 5-7, 14 and 15 were rejected under 35 U.S.C. § 102 as being anticipated by either U.S. Patent No. 6,414,743 to Nishi et al. or the PCT Publication WO 98/48454 also to Nishi et al. Claims 1-6, 14 and 15 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,333,776 to Taniguchi. Claims 1-3, 5 and 6 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,861,944 to Nishi. Applicants submit that the cited art does not teach or suggest many features of the present invention as previously recited in independent claim 1. Therefore, these rejections are respectfully traversed. Nevertheless, Applicants submit that independent claim 1, for example, as presented, amplifies the distinctions between the present invention and the cited.

Independent claim 1 recites a projection exposure apparatus that includes a projection optical system arranged to project a pattern on a substrate, a holding portion arranged to hold an optical element which propagates light toward the projection optical system, a mask having a transmission portion and being disposed on or near an image plane or object plane of the projection optical system or a plane conjugate to the image plane and the object plane, an actuator arranged to drive the mask along a plane of an image of the optical element formed by the projection optical system and a measurement device arranged to measure an intensity of light while the mask is driven, the light emerging from the optical element and passing through the projection optical system and the transmission portion of the mask. The measurement device includes a measurement surface positioned at a plane conjugate to a pupil plane of the projection optical system or a plane spaced apart from the mask enough to separately detect respective rays emerging from plural points of the pupil plane and passing through the transmission portion.

By way of explanation and not limitation, such an arrangement in the present invention is described in the subject specification, for example, at page 46, line 25, through page 47, line 15. As discussed therein, plural positions on the light intensity measurement surface of the light intensity measurement device 18 are in one-to-one correspondence with plural positions on the exit pupil of the projection optical system. In other words, the light intensity measurement device 18, which may have an array of pixels such as a CCD, can be arranged such that the pixels can separately detect plural rays, including the ray A and the principle ray P, emerging from plural points of the pupil plane and passing through the same transmission portion. In order to separately detect such plural rays, the measurement surface can be positioned at a plane conjugate to the pupil plane of the projection optical system by using the pupil imaging optical system. Alternatively, the measurement surface can be positioned at a plane spaced substantially apart from the image plane, at which the mask 17M is located.

According to the present invention, therefore, intensities of respective rays emerging from plural points of the pupil plane and passing through the same transmission portion of the mask can be measured at the plane conjugate to the pupil plane of the projection optical system or at the plane spaced apart from the mask enough to separately detect the respective rays.

Applicants submit that the cited art does not teach or suggest such features of the present invention as recited in independent claim 1. Specifically, Applicants submit that each of the cited documents merely disclose measuring light intensity at an image plane of a projection optical system and have design concepts that are quite different from those of the claimed invention.

The Nishi et al. patent and the '454 PCT Publication disclose an exposure apparatus having an illuminance detector with pinholes 470a and 470b, photoelectric elements 472 and a wafer stage 424 for moving a detector 470. The pinholes 470a and 470b formed in the surface of the detector are arranged at the same level as a top surface of a wafer (image plane). The photoelectric elements 472, however, are arranged at positions very close to the pinholes 470a and 470b. Thus, the photoelectric elements 472 are substantially located on the image plane. In this apparatus, the photoelectric elements 472 should be located on or near the image plane in order to detect an illuminance value reflecting an exposure amount actually provided on the wafer.

Applicants submit that the Nishi et al. and '454 PCT Publication teach away from arranging a measurement surface of a measurement device at a plane conjugate to a pupil plane of a projection optical system or at a plane spaced apart from a mask enough to separately detect respective rays emerging from plural points of the pupil plane and passing through the transmission portion, in the manner of the present invention recited in independent claim 1.

The Taniguchi patent shows an exposure apparatus having a pattern plate 17 with a light-transmitting portion and a photoelectric sensor 9. The pattern plate 17 is disposed such that the surface thereof is flush with the surface of a wafer W. The photoelectric sensor 9 is disposed at the bottom of the pattern plate 17. In the arrangement in this patent, the sensor 9 is provided for measuring distortion. Thus, the sensor 9 must be disposed at the image plane of the projection optical system PL. If the sensor were to be disposed at a position spaced substantially apart from the image plane, the sensor 9 could not provide the information for evaluating the distortion.

Accordingly, Applicants submit that the Taniguchi patent also teaches away from the arrangement of the measurement surface of the measurement device of the present invention recited in independent claim 1.

The Nishi patent shows an exposure apparatus having a sensor 58 with a slit-shaped aperture 75. The sensor 58 in this patent, however, is also disposed at the image plane of the projection optical system. Applicants submit, therefore, that this Nishi patent likewise is silent regarding the arrangement of the measurement surface of the measurement device of the present invention recited in independent claim 1.

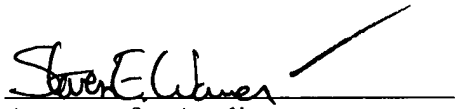
For the foregoing reasons, Applicant submits that the present invention, as recited in independent claim 1, is patentably defined over the cited art, whether that art is taken individually or in combination.

The dependent claims also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in independent claim 1. Further individual consideration of these dependent claims is requested.

Applicants further submit that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the objection and rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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